

21st-century competences and learning that technical and vocational training

Sai Kham Le¹, Su Nandar Hlaing² and Kyaw Zay Ya^{3*}

¹ Mechanical Engineering Department, King Mongkut's Institute of Technology Ladkrabang, **THAILAND**

² Mechanical Engineering Department, Yangon Technological University, **MYANMAR**

³ Institute of International Management and Business Administration, National Cheng Kung University, **TAIWAN**

Abstract: The 21st century is characterized by rapid developments in information technology and automation. Many routine and repetitive jobs are being replaced by machines, including those in production and computers. The technical and vocational education curriculum of this century is full of challenges. Technical and vocational education must create learning that enables students to have the competencies required by the 21st-century workforce. Technological developments are causing changes in economic, social, cultural, and educational aspects. This article aims to examine the competencies necessary for success in the 21st century and the effectiveness of learning strategies for this century. The research used a literature review method. In today's complex work environment, technical and vocational education graduates must possess learning skills, literacy skills, and life skills. Competencies taught to students should focus on a particular area since each worker will perform only one type of work in the workplace. The project-based learning model is recommended for technical and vocational education. Several research studies have shown that this model develops the skills required in the 21st century.

Keywords: Technical and vocational education; 21st century; Competences; 4C skills

*Corresponding Author: kzayya111@gmail.com

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1. Introduction

In the 21st century, economic competition has resulted in a shift towards capital-intensive and labor-intensive production based on technology and science. To prepare for this era of globalization, technical and vocational education must urgently be improved through various methods and efforts. VET systems and practices need to rapidly accelerate and change educational patterns that adhere to the following principles: (4) Accreditation of acquired skills, (5) Integrated management of education and training. The characteristic of technical and vocational education is to prepare students to become effective workers, meet the needs of the workforce in the business and industrial world, and enable them to create jobs for themselves and others.

The world of work is now globalized, and individuals can work in any country, resulting in an increase in job opportunities. However, this also means that the job market is becoming more competitive, and countries are racing to develop effective education systems to meet the challenges of the 21st-century job market. Globalization is also occurring in the world of education, and anyone can study in any country. This demonstrates that a better life is not solely the responsibility of one country, but of humanity as a whole. Technical and vocational education should continue to focus on entry-level prospects, but jobs should be developed into specialists in specific fields of work. Therefore, the prepared strategy should differ from the current one.

The organizers of technical and vocational education must take into account the changing era when formulating policies for learning that will be implemented. The phenomenon of the 21st-century workforce should be the basis for curriculum development and the implementation of learning in vocational education. This article aims to examine the competencies required in the 21st century and how effective 21st-century learning can be. It is expected that this article will serve as a reference for policy makers, curriculum developers, technical and vocational education providers, and education professionals worldwide.

2. Methods

The literature review conducted in this study utilized the narrative review method ([Machi, 2016](#)), where references were gathered from articles that discuss the competencies required in the 21st century and how effective 21st century learning can be. The study explores the how, why, and what related to the topic under discussion.

3. Results and discussion

3.1 The 21st century skills to technical and vocational student

There have been many articles describing the skills needed in the 21st century (Bybee & Fuchs, 2006). Every teacher must prepare students to have this competence ([Haryani et al., 2021](#)). Students need to understand how to learn and use what they have learned efficiently and innovatively in their lives ([Kivunja, 2014](#); [Yu et al., 2019](#)). Every technical and vocational education graduate in all types of expertise must have one competency that is his expertise and must also have the competencies needed in this 21st century (figure 1). There are three categories of competence in the 21st century, including learning skills, literacy skills and life skills ([P21 Framework for 21st century learning, 2007](#)). This must be the basis for every policy maker and educator in conducting technical and vocational education.

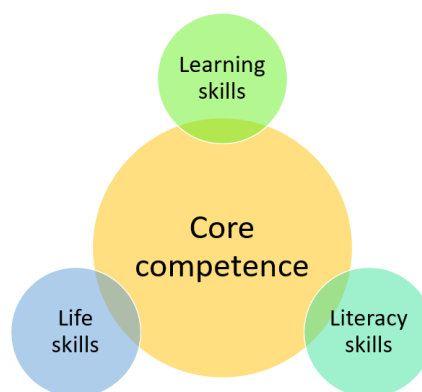


Figure 1. 21st century competence

3.1.1 Core Competence

In accordance with the characteristics of technical and vocational education, that this education prepares students to have competence in certain areas of expertise. There are many technical and vocational education providers who develop a curriculum with many subjects that must be studied. This makes student learning unfocused so that many students do not have special skills. The technical and vocational education curriculum must be designed in such a way that students have special skills and are experts in these skills. In the world of work, every worker does not do all types of work but focuses on the field of work given by the employer. In one field of work there will be many problems and obstacles that will be faced by every worker, because it is not possible in the learning period, they are given many

competencies to be learned. Ideally, students as prospective workers are given lessons that focus on certain fields with many possible cases that will occur when working in the world of work later.

3.1.2 Learning skills

These learning skills are very popularly known as 4C skills. These skills are needed to be able to adapt to an increasingly complex work environment in the 21st century. These 4C skills consist of creative thinking, critical thinking and problem solving, communication, and collaboration ([P21 Framework for 21st century learning, 2007](#)). Learning carried out in technical and vocational education must provide opportunities for students to have these skills.

Creativity is needed to find new innovations. Technology that is increasingly developing requires people who have creativity to find new technologies that can facilitate human work. Creativity is one of the vital skills within the technological era ([Henriksen et al., 2016](#)). Creativity is not only about the products that are manufactured, but also about the work processes that are carried out. Considering that innovation relies upon at the incidence of creativity, carried out to a selected domain, there may be the want to recognize those phenomena, and to decide if they may be independent, associated or complementary ([Nakano & Wechsler, 2018](#)).

Critical thinking skills can help to solve a problem and find a solution. Critical-thinking skills is a higher order of thinking of Bloom's taxonomy ([Anderson et al., 2000](#)). Critical thinking consists of six dimensions. They are interpretation, analysis, evaluation, reasoning, explanation, and self-regulation. When repairing electric vehicles, this stage is used to analyze the damage that has occurred and why ([Lai et al., 2011](#)). Students who can think logically and thoroughly, analyze the information they receive, find solutions to problems, and understand how their world and things have changed are critical thinkers ([Lu & Singh, 2017](#)).

This era of globalization demands that everyone must have good communication skills, ranging from the ability to master international languages and how to communicate effectively both orally and in writing. Communication skills are the basic skills that everyone needs to get their job done ([Biryanto et al., 2018](#)). Communication skills are common skills that need to be developed to successfully enter the VET labor market ([Wahyuni et al., 2018](#)). Communication is technically defined as the process of encapsulating information in packets and sending them over a medium from the sender to the receiver ([Yuniarti, 2016](#)). There are several communication skills that technical and vocational students must master. (2) questioning skills; (3) open communication skills; (4) Maintain decency/courtesy. (5) skills of apology when feeling guilty; (6) responsiveness and sense of responsibility; (7) Care and Consideration. (8) Empathy. (9) Listening comprehension ([Wahyuni et al., 2018](#)). The globalization of this workforce requires that every workforce must be able to work together with other workers who have different backgrounds, cultures, countries, religions and behaviors. Many of the roles are a sequence of interrelated tasks that should be finished collaboratively ([Setiawan et al., 2021](#)). Collaboration commonly refers to an "inter-organizational effort, to deal with issues which might be too complicated and too protracted to be resolved with the aid of using unilateral organizational action", thru which businesses attempt to address turbulence and complexity of their environment ([Naziz, 2019](#)).

3.1.3 Literacy Skills

Literacy skills consciousness on how you could distinguish facts, decide the supply of information and be capable of push back fake information. These skills are indispensable in the rapidly growing information age. There is a lot of information flooding the internet, therefore it takes skill to sort and check whether the information is true or not. The three literacy skills of the 21st century are:

1. Information literacy: know-how facts, figures, statistics, and data
2. Media Literacy: Understanding how information is published and the channels
3. Technological literacy: information the machines that create information

3.1.4 Life skills

Life Skills focuses on survival skills and achieving quality in your personal and professional life. Skills included in life skills include:

1. Flexibility: the ability to adapt easily and the skills to adapt when plans don't go according to plan.
2. Leadership: the ability to lead is important in motivating the team to achieve goals.
3. Initiative: Starting own projects, strategies and plans
4. Productivity: the ability to maintain efficiency in a busy work environment
5. Social skills: the ability to socialize and network with others for mutual benefit

3.2 21st century learning for technical and vocational education

In order for students to have the competencies needed in the 21st century, an appropriate learning model is needed that is applied by the educator. Learning in technical and vocational education is more practical, learning by doing ([Jalinus et al., 2019](#)). In Indonesia, learning in vocational high schools and higher education is directed to using a project-based learning model (PjBL) in each subject. This is because this model provides opportunities for students to learn from doing. During learning students will create a project from the real world.

Various research results reveal that students' 4C skills will increase through learning activities with the implementation of PjBL. PjBL implemented improves creative skills ([Fadhil et al., 2021](#); [Nasution et al., 2021](#); [Yamin et al., 2020](#)), critical thinking skills ([Desiana et al., 2022](#); [Eldiva & Azizah, 2019](#); [Wibowo et al., 2018](#)), communication skills ([Magleby & Furse, 2007](#); [Nova et al., 2019](#); [Putri & Hidayat, 2019](#); [Sagala et al., 2019](#)) and collaboration skills ([Hairida et al., 2021](#); [Kurniawati et al., 2019](#); [Rasyid & Khoirunnisa, 2021](#); [Yabansu et al., 2019](#)). One of the PjBL models developed for technical and vocational education is the PjBL model with seven learning stages ([Jalinus et al., 2017](#)).

4. Conclusions

Graduates of technical and vocational education must possess competencies that are not only related to skill competencies but also must have the skills required in the 21st century. These skills include learning skills, literacy skills, and life skills. The project-based learning model has been proven to improve the skills required in the 21st century.

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Author contribution

Sai Kham Le handled the writing of the original draft and provided review and editing, while Su Nandar Hlaing contributed to the conceptualization, visualization, investigation, and

supervision. Kyaw Zay Ya was responsible for formal analysis, investigation, supervision, and English editing.

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Conflict of interests

The authors declare no conflict of interest.

Ethical clearance

There are no human subjects in this manuscript and informed consent is not applicable.

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